## REMARKS

Claim 31 is amended and Claims 31-60 remain in the application. No new matter is added by amendments to the claims.

**The Rejections:**

The Examiner rejected Claims 31-33, 37-39, 40, 42, 44, 46, 48, 49, 51, 55, and 56 under 35 U.S.C. 103(a) as being unpatentable over Takeo (US Patent 4,721,630) in view of Yamamoto (US Patent 5,240,745) and Pearce (US Patent 4,781,517).

As to Claim 31, the Examiner stated that Takeo discloses a modular apparatus for performing a process on an object conveyed to and from a location, comprising a pair of frame rails (items 11, see Figure 1) extending on opposite sides of a location and generally parallel to a path of conveyance of an object through the location, at least one robot arm (items $5_1$ and $5_2$) mounted on an associated on of each of the frame rail, and a tool mounted on each of said at least one robot arms for performing a process on the object whereby the at least one robot arms move the tools relative to the object enabling the tools to perform processes on the objects. The Examiner admitted that Takeo does not disclose that there are at least two legs attached to each of the frame rails for elevating the frame rails above a plane of an upper surface of the object at the location, and at least one cross support member connecting the frame rails together to from a rigid structure with legs.

The Examiner stated that Yamamoto (especially with reference to Figure 15) discloses that it is known to elevate painting robots by placing them on cross support members (item 572) on elevated frame rails (item 518) mounted on legs (items 94a(b), 94c(d), and 38- best seen in Figure 16) and the cross support member connects the frame rails, forming a rigid structure with legs. According to the Examiner, one in the art would appreciate that elevated positioning would enable better coating of the roof of the car body, while still maintaining the capability of coating the sides of the car body. The Examiner admitted, however, that Yamamoto does not place the robots on the frame rails.

The Examiner stated that Pearce, though, discloses a modular apparatus for performing a process on an object conveyed to and from a location comprising a pair of frame members (see Figure 2, which discloses a fixed frame and a single robot attached to the two fixed frames)

extending on opposite sides of a location and general parallel to a path of conveyance of an object through the location, at least two legs (items 13, 18, 19 and 20 in Figure 2) attached to each of the frame rails for elevating the frame rails above a plane of an upper surface of the object at the location, at least one cross support member (item 23 in Figures 2) connecting the frame members together to form a rigid frame structure with the legs, at least one robot arm (items 71 and 114) mounted on an associated one of the frame members, and a tool mounted on the at least one robot arms for performing a process on the object whereby the at least one robot arms move the tools relative to the object enabling the tools to perform processes on the object. According to the Examiner, Pearce discloses, as shown in figure 2, that both frame rails are fixed as claimed and placing the robots on the frame rails in opposed configuration as in Pearce would enable symmetrical process of a car body and better processing or coating reach of the car roof as in Yamamoto. The Examiner further stated that the cross support both Pearce and Yamamoto would reduce the possibly of collapse by improving structural support and, therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized movable robots mounted on fixed elevated frame rails mounted on fix legs in order to provide better coating reach of the car roof and to have utilized a cross support in order to provide structural support.

As to Claim 32, the Examiner stated that Takeo discloses that the robot arms extend to reach the tooled mounted thereon to all exteriors surface on one side of the object.

As to Claim 33, the Examiner stated that Takeo discloses that the robots are positioned in opposition to provide symmetric processing to the object.

As to Claims 37 and 38, the Examiner stated that Takeo discloses that each robot arm is a 6-axis robot with a wrist implement, with the non-wrist component of the arm having 3 axes, including axes for defining a generally vertical planar operating space, and the wrist component being connected to the free end of the arm and the tool, the wrist component having 3 axes (column 6, lines 48-64).

As to Claim 39, the Examiner stated that Takeo discloses 6 axes of motion, including the four claimed.

As to Claim 40, the Examiner stated that Takeo, as modified by Yamamoto and Pearce and applied to Claim 1 (Applicants note that Claim 1 was canceled in the previous amendment)

above discusses the pair of frame rails mounted on opposite sides and extending generally parallel to the path of movement of the object (Takeo and Pearce), the frame rails being elevated above a plane of an upper surface of the object (see Pearce and Yamamoto), the frame rails being connected together in a rigid frame structure (Pearce and Yamamoto), at least one robot arm mounted on an associated one of each of said frame rails (Takeo), and that the robot arm is movable along the associated frame rail (Takeo and Pearce), and that both frame rails cannot move relative to each other, and both frame rails do not move relative to said frame (Pearce).

The Examiner also stated that Takeo further discloses that each robot arm has at least two axes of motion for movement in a generally vertical plane transverse to the path of movement of the object (see column 6, lines 48-64). Takeo also further discloses that the tool is a paint applicator (bell type atomizers $5_f$) mounted on each of the at least one robot arms (items $5_1$ and $5_2$) and the arms move the paint applicators relative to the object while the paint applicators dispense paint to cover the upper surface and side surfaces of the object with paint.

As to Claim 42, the Examiner stated that both Pearce and Takeo disclose opposed symmetric robot designs. Takeo as incorporated discloses the capability of symmetric painting.

As to Claim 44, the Examiner stated that Pearce as incorporated discloses that the frame rails are mounted on floor engaging legs (see Figure 2).

As to Claim 46, the Examiner stated that Pearce discloses that the frame rails are connected by at least one cross support member elevated above the plane of the upper surface of the object.

As to Claim 48, the Examiner stated that Takeo, Yamamoto and Pearce as applied to Claim 1 above disclose or make obvious a modular apparatus for painting an object conveyed along a path, comprising a pair of frame rails (disclosed by Takeo, Yamamoto and Pearce) mounted on opposite sides of a path of conveyance of an object, the frame rails being elevated above a plane of an upper surface of the objects (Yamamoto and Pearce, as incorporated and applied in Claim 1 above), at least one robot mounted on an associated one of the frame rails (Takeo and Pearce) and being movable along the associated frame rail (see Takeo, Yamamoto and Pearce as applied in Claim 1 above), and that both frame rails cannot move relative to each other, and both frame rails do not move relative to said frame, therefore being secured against movement relative to the other of the frame rails.

Furthermore, according to the Examiner Takeo discloses that each robot arm is a 6 axis robot with a wrist implement, with the non-wrist component of the arm having 3 axes and the wrist component of the arm having 3 axes (column 6, lines 48-64), and that there is a paint applicator (bell atomizers) mounted on each of said at least one robot for painting surfaces of the object.

As to Claim 49, the Examiner stated that Takeo as incorporated discloses that at least one robot has an articulated arm with a paint applicator attached to a free end thereof capable of reaching substantially all external surfaces on a facing side of the object.

As to Claim 51, the Examiner stated that Pearce as incorporated (and applied in Claim 1 above) makes obvious that the frame members are mounted on legs engaging a floor of a painting booth and are connected by at least one cross support member elevated above the plane of the upper surface of the objected to form a rigid frame structure (see figure 2).

As to Claim 55, the Examiner stated that Takeo, Yamamoto and Pearce as applied to Claim 1 above disclose or make obvious an apparatus for processing an object moving along a path, comprising at least one frame rail (Takeo, Yamamoto, and Pearce) mounted to extend along a side of a path of movement of object, the at least one frame rail being elevated above a plane of the upper surface of the object (see Yamamoto and Pearce as applied to Claim 1 above), at least one robot arm, and a tool mounted at a free end of the at least one robot arm for performing a process on the object, and that both frame rails cannot move relative to each other, and both frame rails do not move relative to said frame, although the two frame rails do move together.. However, the frame rails are considered capable of being kept stationary if desired, and therefore, are capable of meeting the intended use of being prevented from moving relative to the object.

The Examiner also stated Takeo also further discloses a mounting base (i.e., movable tables $12_1$ and $12_2$) attached to an movable along the frame rails which are capable of movement on the frame rails (item 11, recited as railway means, see column 6, line 44 to column 7, line 2), and that the robot arm has four axes of movement relative to the mounting base (Takeo discloses 2 more movement axes, for a total of 6).

As to Claim 56, the Examiner stated that Takeo discloses a robot wherein said four axes of movement include two primary axes of operation defining a planar operating space for the tool transverse to the path of movement of the object.

The Examiner rejected Claims 34, 52 and 60 under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Pearce as applied to Claims 31, 51 and 55 above, and further in view of Thome (US Patent 5,744,190).

The Examiner admitted that the references as applied to Claim 1, 21 and 25 (Applicants note that these claims were canceled in the previous amendment) above are silent as to the robot arms including a process controller mounted for movement therewith along the associated frame rail. However, as to Claims 34, 52, and 60, according to the Examiner Thome discloses that it is known to include process controller (control systems 109a) within the robot bodies as Thome utilizes the process controllers in conjunction with sensors for robot feedback, and one in the art would appreciate that the close proximity of the control device to the sensors reduces the amount of wiring needed between the process control and the sensor. Therefore, the Examiner believes that it would have been obvious to one of ordinary skill in the art to have utilized such process controls in order to reduce wiring between the robot feedback mechanism and the process control and, furthermore, such a placement would result in the system being mounted for movement along the associated frame rail in the context of the robots used in Takeo (as modified by Yamamoto and Pearce).

The Examiner rejected Claims 35 and 53 under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Pearce and Thome as applied to Claims 4 and 22 (Applicants note that these claims were canceled in a previous amendment) above, and further in view of Cebola (US Patent 5,738,727). The Examiner admitted that Takeo, Yamamoto, Pearce, and Thome as applied to Claim 4 do not disclose that the cross support member is hollow for receiving cables and conduits connecting the process controllers together. The Examiner stated that Cebola discloses that it is known to make structural elements hollow or tubular for receiving cables and conduits connecting the process controllers together and Cebola discloses that shielding these cables protects from electrostatic fields and charges (see column 7, lines 37-45). Therefore, according to the Examiner, it would have been obvious to one of ordinary skill in the art to make cross beams and support elements tubular or hollow for receiving cables and conduits in order to protect the cables and conduits from electrostatic effects and charges.

The Examiner rejected Claims 36 and 54 under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Pearce and Thome as applied to Claims 34 and 52 above, and further in

view of Neikter (US Patent 5,296,026). The Examiner admitted that Takeo, Yamamoto, Pearce, and Thome as applied to Claims 34 and 52 above do not suggest that at least one cross support member is tubular and purged with an inert gas or air for explosion protection as in claims 36 and 54. The Examiner stated that Neikter discloses that it is known for the cross support (item 20) to have a gas permeable tubular element (item 22) surrounding the cross support for generating a positive pressure (see column 4, lines 12-29) and Neikter also discloses that the gas presented to the room can be an inert gas such as argon (see column 5, lines 10-17). According to the Examiner, one in the art would appreciate that this would protect the robots from explosion and prevent chemical interactions with the paint material and, therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized cross supports which spread inert gas in order to protect the robots from explosion and prevent chemical interactions with the paint material.

The Examiner rejected Claims 43 and 50 under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto and Pearce as applied to Claims 40 and 48 above, and further in view of Josefsson (US Patent 5,766,355). The Examiner admitted that Takeo, Yamamoto, and Pearce as applied to Claims 40 and 48 above do not suggest that the frame rails are mounted on walls of a paint booth extending generally parallel to the path of movement. The Examiner stated that Takeo, Yamamoto, and Pearce have been applied to show the frame rails. The Examiner noted that Josefsson discloses: that it is known to have painting robots mounted inside of a paint booth; that the use of such a paint booth confines the paint to the chamber, and facilitates collection of the paint overspray (see column 2, lines 40-61); and that collection of the overspray in a paint booth allows for the later reapplication of the excess paint to subsequent automobiles (see column 3, lines 29- 43), which one in the art would immediately recognize as reducing material costs. According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized a paint booth with walls (as in Josefsson) in conjunction with the frame rail robot design (of Takeo, Yamamoto and Pearce) in order to confine the paint overspray and facilitate paint re-use, thus reducing paint material costs.

The Examiner rejected Claims 45, 47, 58 and 59 under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto and Pearce as applied to Claims 40, 46, and 55 (in the case of both Claims 58 and 59) above, and further in view of Cebola (US Patent 5,738,727). As to

Claims 45, 47 and 58, the Examiner admitted that Takeo, Yamamoto, and Pearce as applied to Claim 40 or Claim 46 above do not disclose that either the frame rails are tubular, or the frame rail and cross support member are tubular. The Examiner noted that Cebola discloses that it is known to make structural elements hollow or tubular for receiving cables and conduits connecting the process controllers together and that shielding these cables protects from electrostatic fields and charges (see column 7, lines 37-45). Therefore, according to the Examiner, it would have been obvious to one of ordinary skill in the art to make cross beams and support elements tubular or hollow for receiving cables and conduits in order to protect the cables and conduits from electrostatic effects and charges.

As to Claim 59, the Examiner stated that Cebola as incorporated in Claim 28 (Applicants note that Claim 28 was canceled in a previous amendment) above discloses coupling conduits stored with the structural elements (see Figure 4, items 224 and other items).

The Examiner rejected Claims 41 and 57 under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Pearce as applied to Claims 10 and 25 (Applicants note that these claims were canceled in a previous amendment) above, and further in view of Hohn et al (US Patent 4,896,274). The Examiner stated that Takeo as applied to Claim 10 or 25 does disclose a 6-axis robot with three of the axes being in a wrist mounting, but that Takeo is silent as to the capabilities or movements of the 3-axis wrist mounting, and one would expect any conventional 3-axis wrist mounting to be used. The Examiner stated that Hohn discloses a known 3-axis wrist mounting (item 27), for use in either adhesive application or paint spraying (column 3, line 36) in automobile industries, which is part of a larger, 6-axis robot, similar to that in Takeo which discloses two tilting axes (at pivot points 28 and 30), and a rotating axis (at point 32, as see column 3, line 65 to column 4, line 16 for discussion of the movements). According to the Examiner, Hohn recites that these three axes are intended to effect control over the orientation of the tool carried by the manipulator (or robot) with respect to a relocatable point of reference and, therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized a wrist having a rotating axis and a tilting axis as in Hohn in order to effect control over the orientation of the tool carried by the manipulator (or robot) with respect to a relocatable point of reference.

**The Cited References:**

Takeo shows an apparatus for painting the inner panel portions of vehicle body front and rear lids and doors using front and rear painting robots. The Takeo apparatus moves a vehicle body **W** to a painting stage **A** positioned between first and second railway means **11** mounted on a floor at the painting stage **A**. The rails **11** are positioned well below the bottom of the vehicle body **W**, as seen in Fig. 2, as are tables $12_1$, $12_2$ movable along the rails and carrying robots $5_1$, $5_2$ respectively.

Yamamoto shows, in Figs. 15 and 16 referenced by the Examiner, a painting apparatus **500** that has floor mounted rails **518a, 518b** positioned on opposite sides of a path of travel of a vehicle body **522**. Contrary to the Examiner's statement, the rails **518a, 518b** are not elevated. These same rails are identified as **34a, 34b** in Fig. 16 since they are the same as the previous embodiment. The vertical posts **38** move along the rails **518a, 518b** and support opposite ends of a painting mechanism **520** that has a plurality of paint spray guns **574a** through **574i** mounted on a horizontal arm **572**. Contrary to the Examiner's statement, Yamamoto does not show any painting robots. Also contrary to the Examiner's statement, the posts **38** and the arm **572** do not form a rigid structure with the rails **518a, 518b** since they are movable along the rails.

Pearce shows, in Fig. 2 referenced by the Examiner, four vertical posts **13, 18, 19** and **20** supporting a frame **21** formed by two lateral members **22** attached to two transverse members **23**. A bridge member **24** has opposite ends **43** movable supported on the transverse members **22**. A robot carriage **71** is mounted for movement along the bridge member **43** transverse to the path of travel of a vehicle body **50**.

Thome shows floor mounted painting robots connected to controllers.

Cebola shows a roof machine having paint sprayers connected to conduits and cables for coating product, air and electric current wherein the conduits and cables are housed in a beam carrying the sprayers.

Neikter shows painting "automatics" **5, 6** enclosed in flexible, gas-permeable material enclosures **12, 22**. The enclosures **12, 22** are pressurized such that part of the air flows out to repel paint particles.

Josefsson shows a paint spray booth for the application of powder paint from fixed applicators **104a, 104b, 214, 314**.

Hohn shows a robot with an adhesive material dispensing gun **120** mounted on a wrist **27** having three axes of motion.

**Applicants' Response:**

Applicants believe that the Examiner's application of the cited references to previously canceled Claim 1 in the above rejections actually involve Claim 31. Applicants have not attempted to match any of the other previously canceled claims mentioned by the Examiner with pending claims.

Independent Claims 31, 40, 48 and 55 are rejected based upon the combination of Takeo, Yamamoto and Pearce. However, these references do not show or suggest the combination of elements defined by Applicants' claims.

Applicants amended Claim 31 to clarify that the object has sides as well as the upper surface, the at least one cross member fixedly connects the frame rails together and the robot arms are extendable below the associated frame rails.

Takeo shows first and second railway means **11** mounted on a floor. The Examiner admitted that Takeo doesn't show legs for elevating the frame rails above a plane of an upper surface of the object and at least one cross support connecting the frame rails to form a rigid structure as defined by Claim 31. Claim 40 doesn't mention the legs or the cross support, but defines the elevated frame rails as being connected together in a rigid frame structure. Claim 48 doesn't mention the legs or the cross support, but defines the elevated frame rails as being secured against movement relative to each other. Claim 55 doesn't mention the legs or the cross support, but defines at least one elevated frame rail as being prevented from moving relative to the object.

Furthermore, nothing in Takeo suggests that the rails **11** can be elevated above the upper surface of the vehicle body **W**. According to the Examiner, one in the art would appreciate that elevated positioning of the Takeo painting apparatus would enable better coating of the roof of the car body, while still maintaining the capability of coating the sides of the car body. However, the Takeo painting apparatus is not used to paint the roof and sides of the vehicle body. Takeo shows an apparatus for painting the inner panel portions of vehicle body front and rear lids and

doors using front and rear painting robots. Elevating the rails **11**, as suggested by the Examiner, would prevent the robots $5_1$, $5_2$ from reaching the inner panel portions to be painted.

The Examiner cited Yamamoto (especially with reference to Figure 15) as disclosing that it is known to elevate painting robots by placing them on cross support members (item 572) on elevated frame rails (item 518) mounted on legs (items 94a(b), 94c(d), and 38- best seen in Figure 16) and the cross support member connects the frame rails, forming a rigid structure with legs.

**Yamamoto does not disclose elevating painting robots above an object.** Yamamoto does not have elevated painting robots. Elements **574a-574i** are not robots, but are described as spray guns, i.e., paint tools which are usually carried by the robots. The whole painting apparatus **500** may be characterized as a robot assuming that it complies with the accepted definition of a robot as a programmable multi-function manipulator having several degrees of freedom as known to one of ordinary skill in the art. The "robot" **500** is positioned on the floor and is movable along the rails **34a, 34b (518a, 518b)** just like the robots of Takeo. Accordingly, Yamamoto does not disclose that it is known to elevate painting robots by placing them on cross support members etc. and, therefore, adds nothing to the disclosure of Takeo. Yamamoto simply discloses that is known to **elevate painting tools** above the object to paint its upper surfaces.

**Yamamoto does not disclose placing paint robots on cross support members.** The whole "robot" **500** of Yamamoto is placed on the floor and is movable along the rails **34a, 34b (518a, 518b)**. Movable elements of the robot **500**, items **38, 520, 572** are equivalent to robot links and represent the robot axes of motion.

**Yamamoto does not disclose that the cross support member connects the frame rails together to form a rigid frame structure.** In Yamamoto the cross support member **572** moves up and down the legs **38**, and moves with the legs on the frame rails **34a, 34b (518a, 518b)**. Thus, the robot **500** does not form a rigid frame structure with the frame rails as defined by Applicants' claims.

The Examiner commented that Pearce discloses an embodiment (Figure 2) which discloses the frame structure as claimed and one in the art would appreciate that this structure provides a fixed support for controlling and supporting the operations.

**Pearce does not disclose a robot attached to two fixed frames.** The Pearce frame **21** has lateral members **22** (frame rails) and transverse members **23** (cross support members) supported on vertical posts **13, 18, 19,** and **20** (legs). Item **24** is identified as "bridge member" which carries the robot **71**. Hence the robot **71** is not located on, mounted on or attached to the frame rails **22**, but is movably mounted on the bridge member **24** that is not part of the frame or frame rails.

**Pearce does not disclose placing robots on opposed frame member rails.** The robot **71** in Pearce is placed on the bridge member **24** which is not a portion of the fixed frame **21**. If the argument is made that the combination of **71** and **24** is considered a robot, the robot will not be mounted on "associated one of the frame rails" but rather on both frame rails **23**. The claimed invention has the distinction to mount at least one robot on an associated one of the frame rails and for two robots on opposite rails to move independently. For Pearce to have two robots, two of the bridge members **24** would be required and they could not pass along the frame rails independently as they could not cross by each other.

None of the other cited references provide the elements missing from the combination of Takeo, Yamamoto and Pearce.

In view of the amendments to the claims and the above arguments, Applicants believe that the claims of record now define patentable subject matter over the art of record. Accordingly, an early Notice of Allowance is respectfully requested.